EcoHealth Alliance

Health Impacts of Land-Use Change Toolkit

Understanding and preventing the health impacts of land-use change in our communities

Local conservation.
Global health.

Conservation Medicine

Health Impacts of Land-Use Change Toolkit

Understanding and preventing the health impacts of land-use change in our communities

Health Impacts of Land-Use Change

Changes in how land is used affects:

- biodiversity & the health of the environment,
  - which impacts human health

Goals:

- Discuss **how** land use change can impact **our health**
- Think about how to reduce negative health impacts of land use change

Toolkit Objectives

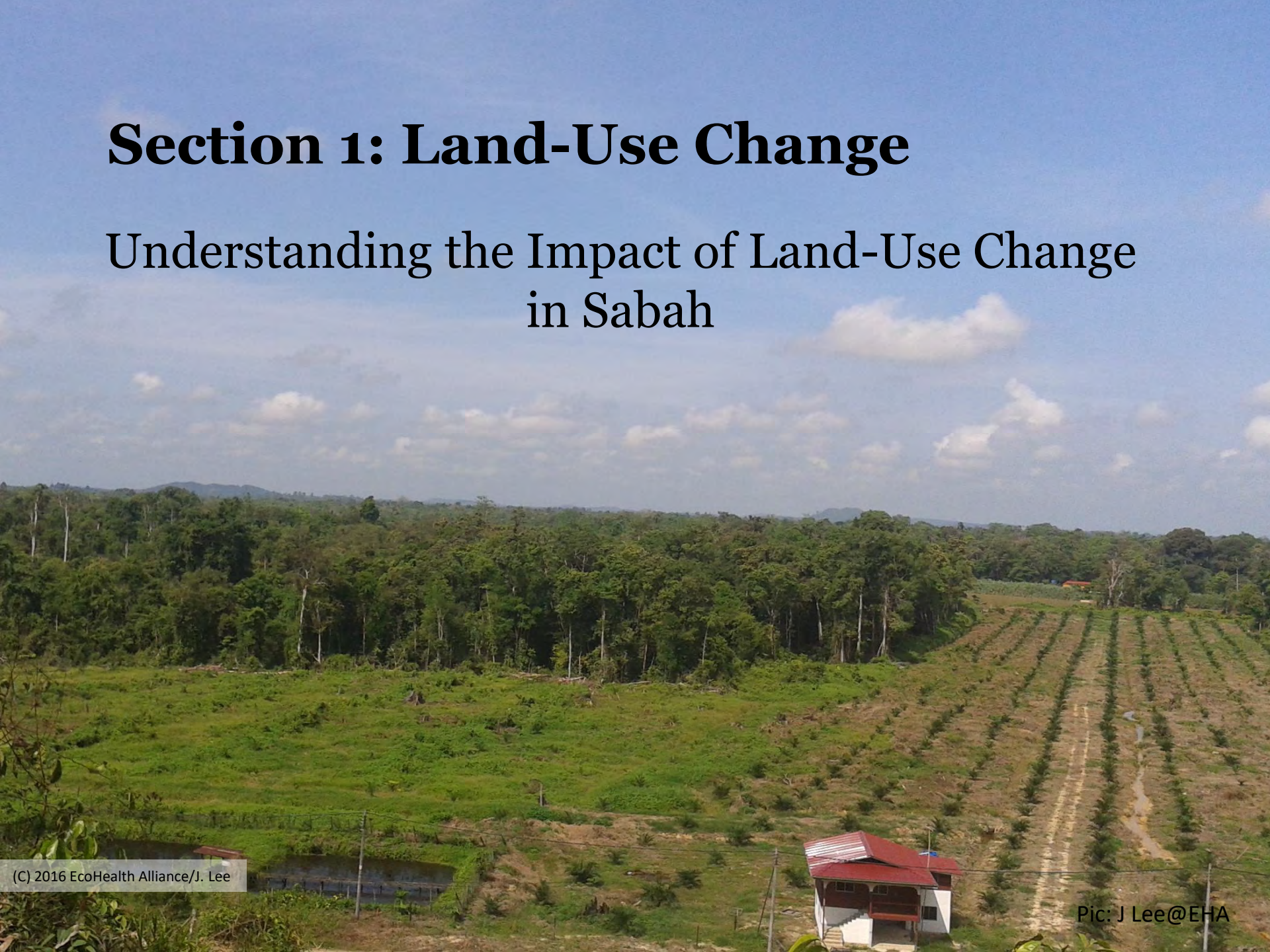
1) Understand types of land use change happening in Sabah
2) Identify links between human, animal, and environmental health
3) Identify health impacts of land-use change
4) Create strategies to mitigate health impacts of land-use change

Health Impacts Toolkit: Structure and Content

- 4 sections:
  1) Land-Use Change
  2) One Health Approach
  3) Health and Land-Use Change Links
  4) Economic Costs of Land-Use Change and Mitigation Strategies
- Each section 30-45 minutes including discussions
  - Interactive and participatory
  - Break between each section

Section 1: Land-Use Change

Understanding the Impact of Land-Use Change in Sabah



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Pic: J Lee@EHA

Land-Use

- How is land used?
- What are different ways we can use land?

The way a piece of land can be used is its '**land-use type**'

Land-use type: Agriculture Commercial and Smallholding

Land-use type: Transportation

Railway

(C) 2016 www.keretapi.com

Road

(C) 2016 EcoHealth Alliance/A. White

Trail in the plantation

(C) 2016 EcoHealth Alliance/J. Lee

Port

(C) 2012 Goldbank/ R. Anindito

Land-use type: Human Development Urban and Rural

School

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Urban development

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Rural development

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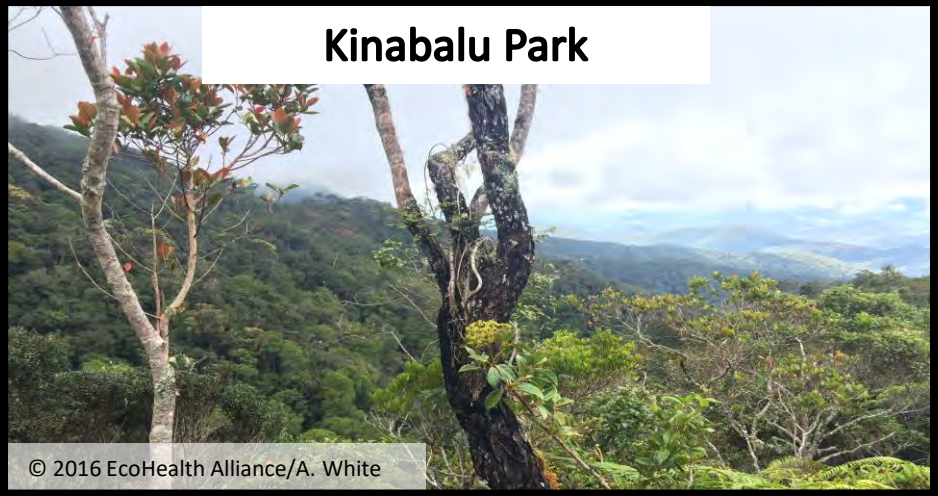
Shopping complex

© 2015 Suria Sabah Shopping Mall

Land-use type: Reserves, Pristine and Protected Areas

Kinabalu Park



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Tunku Abdul Rahman Park

© 2015 Sabahstete.com

Kinabatangan Wildlife Sanctuary

© 2016 Asia Advventures

Maliau Basin

© 2013-2014 yayasan sabah

Activity: What land uses do you see?

Activity: What land uses do you see?

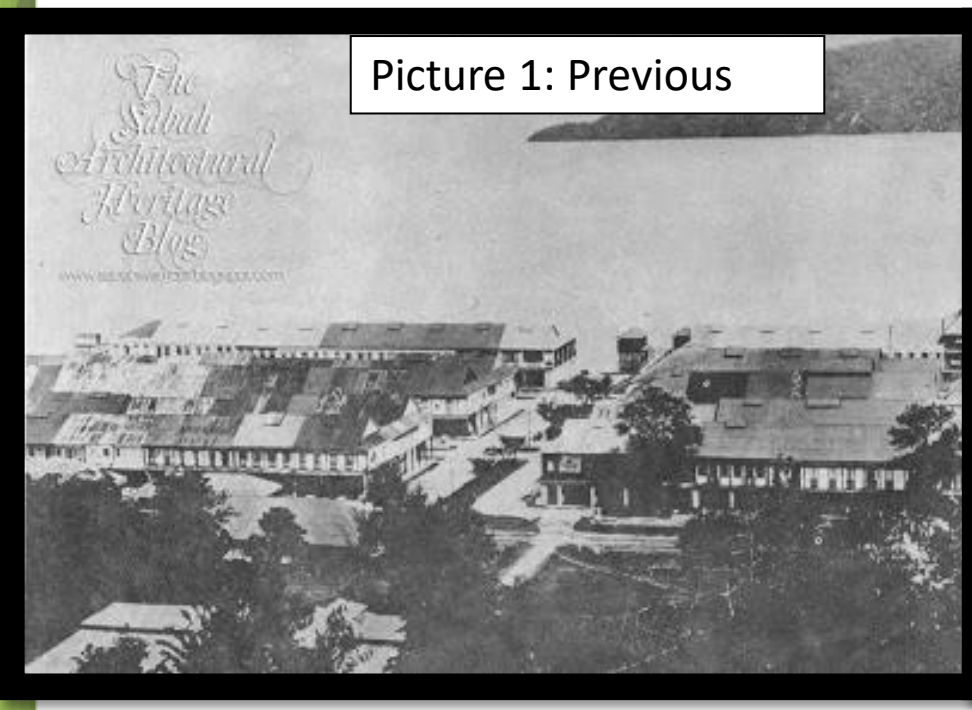
How does land-use change?

- Land can go through various changes, many of which are caused by humans

Changes in how land is used is referred to as **land-use change**.

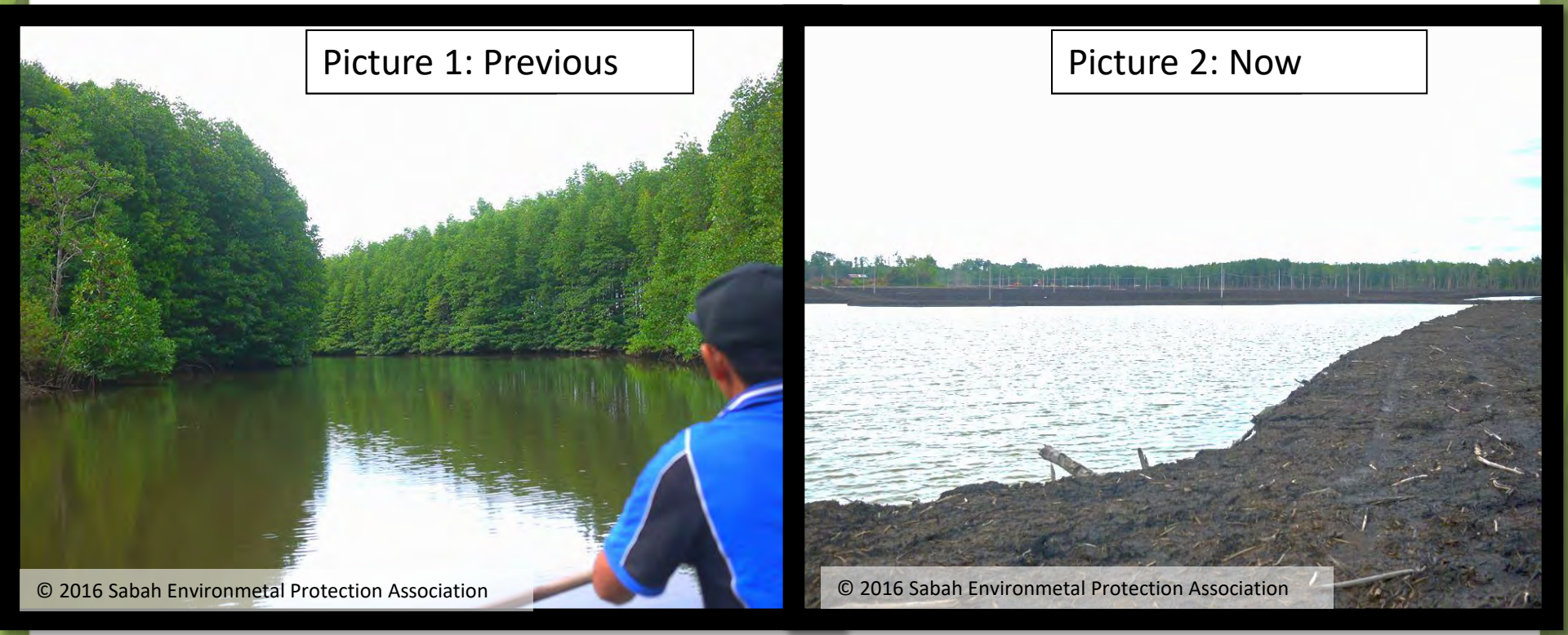
- Change from one type to another can **impact** the **environment**, **economics**, and **health**
- Types of land-use change: Urbanization, Deforestation, and Reforestation

How does land-use change?



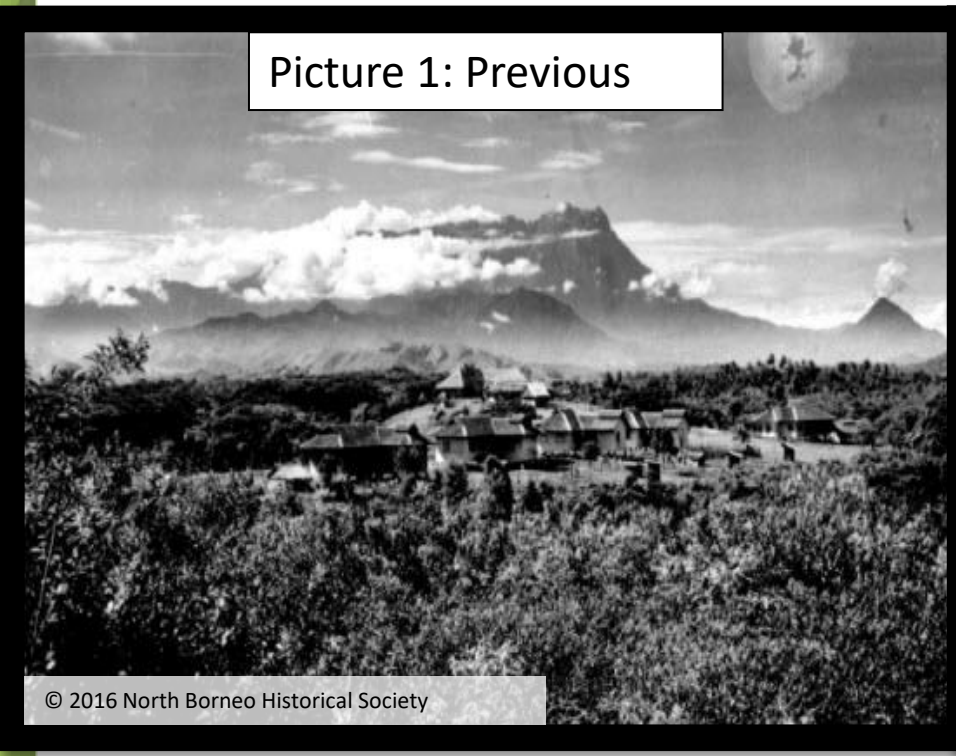
Quiet town in 1930 to busy metropolis in 2015

How does land-use change?



Mangrove forest to shrimp farm

How does land-use change?



Mysterious mountain in 1950 to tourist hot spot from 1964-today

How does land-use change?

Pristine forest to oil palm plantation

The Value of Land

- Land use change describes **how** lands are changed

- The value of land influences **why** land is changed.

The Value of Land

Land value is sometimes grouped into four types: **spiritual**, **cultural**, **aesthetic**, and **economic**.

Spiritual	**Cultural**
Aesthetic	**Economic**

The Value of Land

Spiritual

- Ancestral
- Religious

Cultural

- Art
- Literature
- Tradition

The Value of Land

Aesthetic

- Beauty
- Uniqueness

Economic

- Tourism
- Natural Resources
- Subsistence
- Agriculture

The Value of Land: Ecosystem Services

Ecosystem services value for land is categorized into four groups: **provisioning** services, **regulating** services, **cultural** services, and **supporting** services.

What are ecosystem services?

Benefits humans derive from ecosystems

What is an ecosystem?

A community of animals and plants interacting with one another and with the nonliving environment. Humans are an integral part of ecosystems.

Ecosystem Services Value

Provisioning Services

Products obtained from ecosystems

- Food
- Fresh Water
- Fuel
- Fiber/textiles
- Medicine

Regulating Services

Benefits obtained from regulation of ecosystem processes

- Pollination
- Water purification
- Erosion control
- Disease regulation
- Climate Regulation

Cultural Services

Nonmaterial benefits from ecosystems

- Spiritual
- Recreation & Ecotourism
- Educational

Supporting Services

Services necessary for the production of all other ecosystem services

- Photosynthesis
- Soil creation
- Nutrient cycling

Ecosystem Services Value

Provisioning Services:
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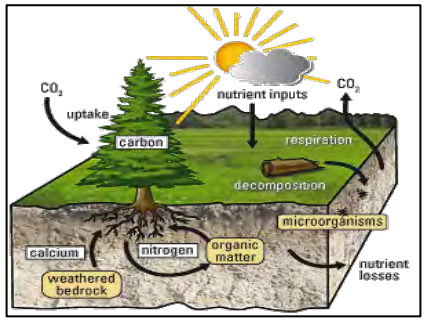
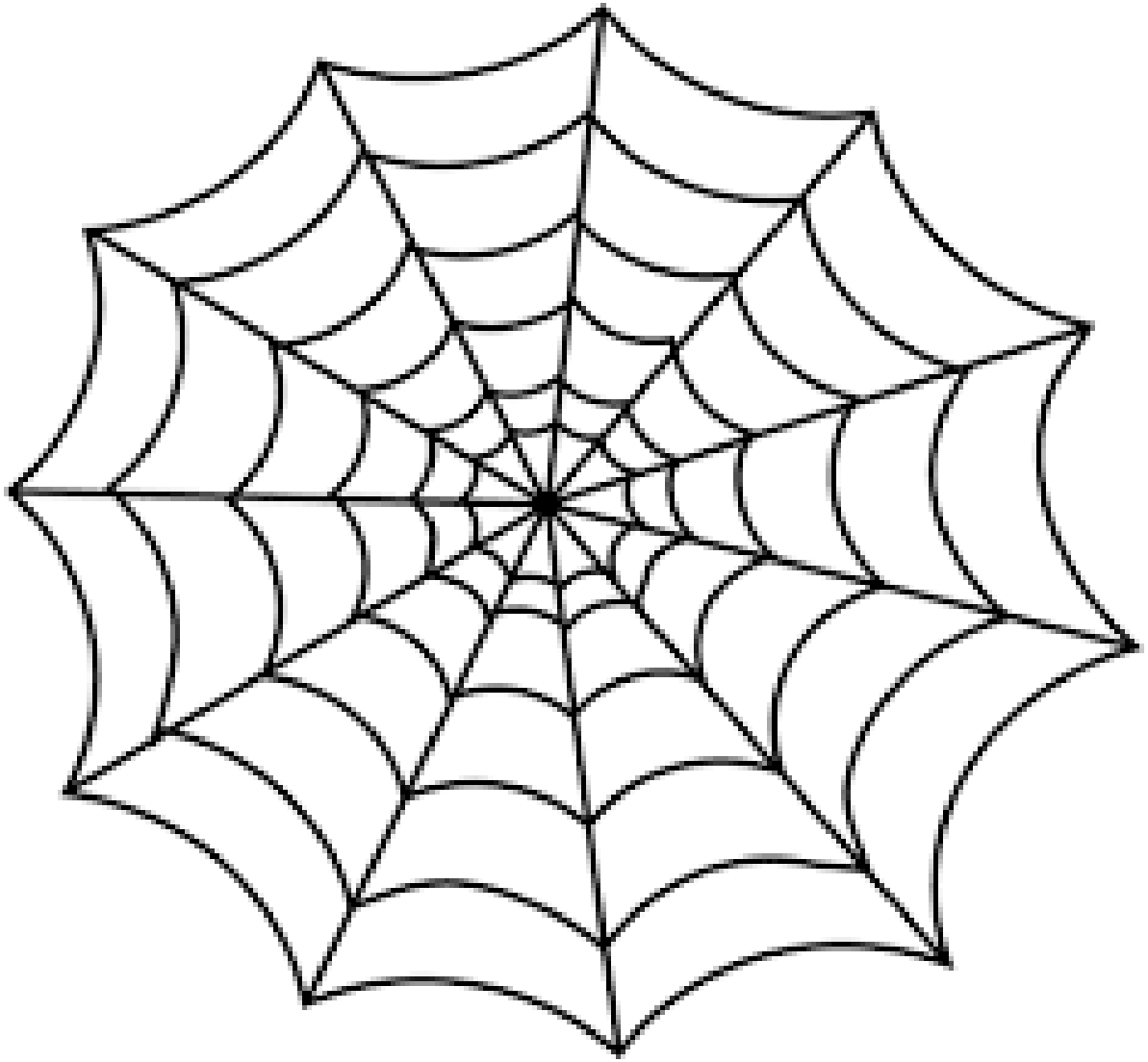


Activity: Web of Life



The Value of Land

Land use change describes **how** lands are changed, but the value of land influences **why** land is altered.

- Lands are valued differently by individuals and by groups of people
- These different values should be considered when planning for land-use change

Discussion: Land Value & Land Use Change

- How do *you* value land?
- What changes have you seen in how land is used?
  - In the past year? 5 years? 20 years?
  - What do you think are the biggest changes?
- What values are reflected in these changes?

Section 2: Land-Use Change and Health

How are land-use change and health connected?

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What is One Health?

- **One Health**: the health of **humans** is connected to the health of **animals** and the **environment**.
  - All are **interconnected**.
- The focus of One Health is not just disease in a single individual or species, but functioning of ecosystems.

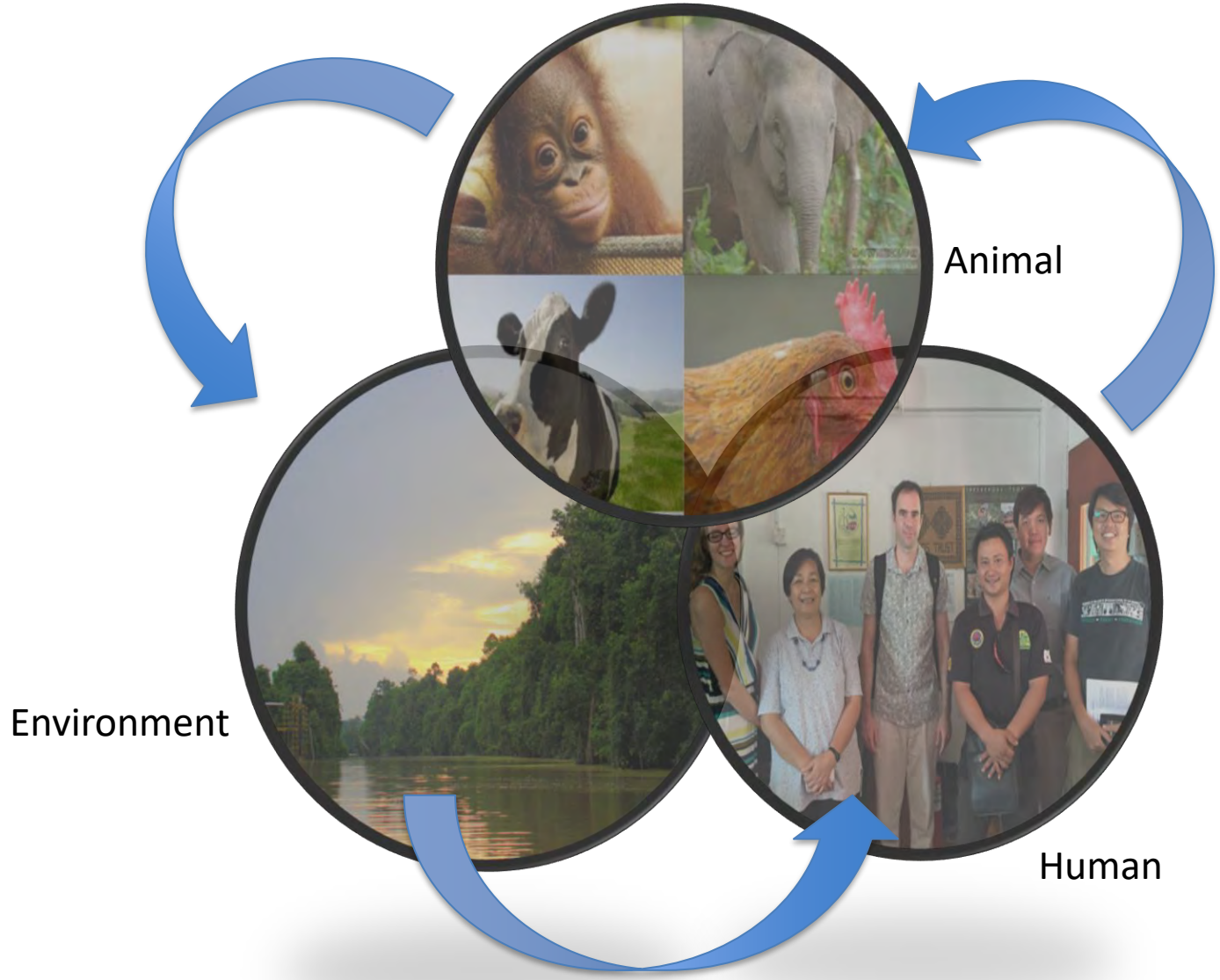
Health Impacts of Land-Use Change

Animal health, environmental health, and human health are interconnected.

Changes in the way land is used influences biodiversity and the health of the environment which can, in turn, impact human health

- Examples: air quality, water quality, increases in infectious disease transmission, potential mental health and livelihood impacts

One Health & Sabah:
How does One Health fit in to Sabah?

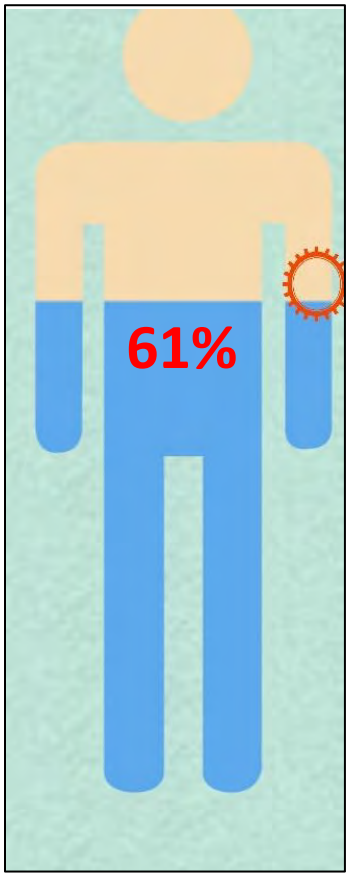


Healthy Environments and Healthy People

- Water Quality

- Air Pollution

Human-Animal Health Links



Most known human infectious diseases are shared with animals

Of every 100 infectious diseases more than 60 shared with animals

Over **1,000,000,000** human cases <u>every year</u>

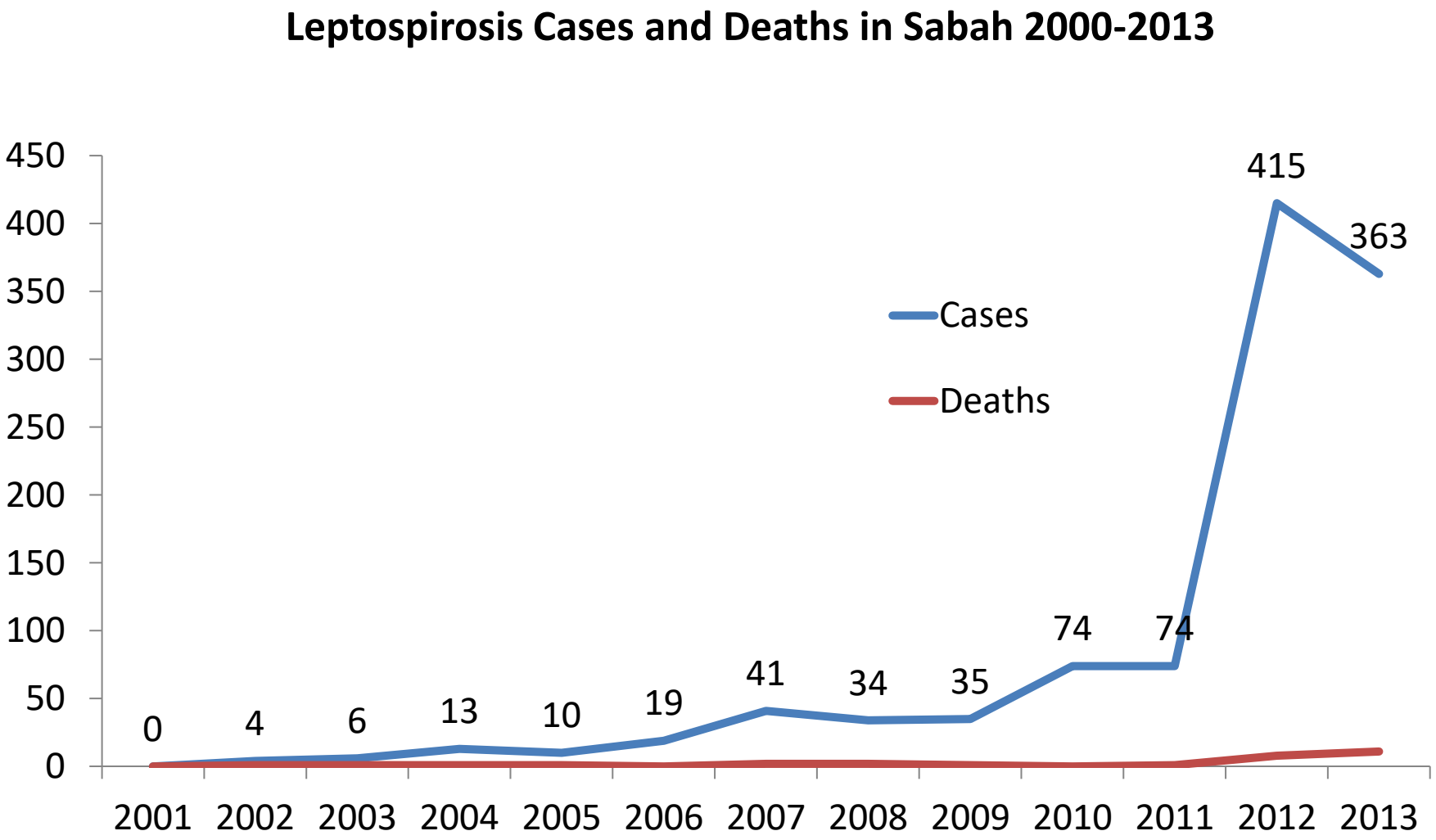
One Health & Sabah: Leptospirosis

- Leptospirosis: bacterial zoonotic infection impacting animals, wildlife, and humans
  - Zoonosis: disease which can be passed from animals to humans
- Can cause severe kidney problems in people

One Health & Sabah: Leptospirosis

- Transmitted via contact with urine of an infected animal or the animal
- Linked with flooding and other environmental factors
- Human, domestic animal, and wildlife disease and can be prevented and controlled via environmental controls and reduced contact with rodents and other animals

One Health & Sabah: Leptospirosis

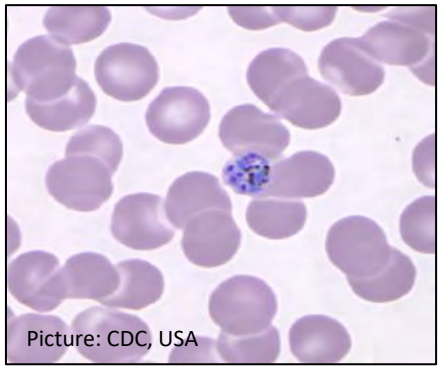


Source: Department of State Health Sabah

Malaria

- A parasitic infection transmitted by mosquitos
- Can be passed via mosquito between monkeys and humans
- *Plasmodium knowlesi* in Malaysia primarily found in non-human primates but can cause diseases and deaths in humans

Photo: Donna Legare

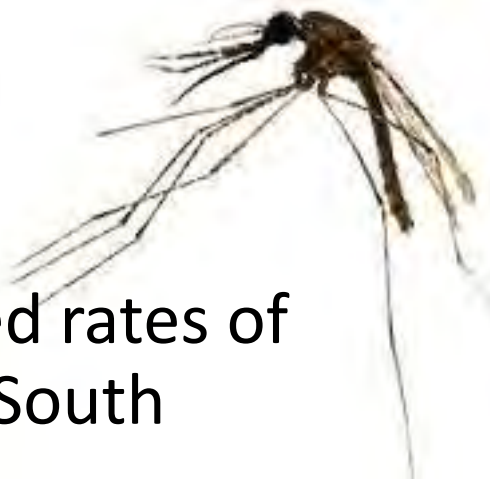

Picture: CDC, USA

P. Knowlesei-caused Malaria cases in Sabah 2007-2014

	2007	2008	2009	2010	2011	2012	2013	2014
P. knowlesei	**1**	**31**	**79**	**6**	**209**	**365**	**695**	**1064**

Source: Department of State Health Sabah

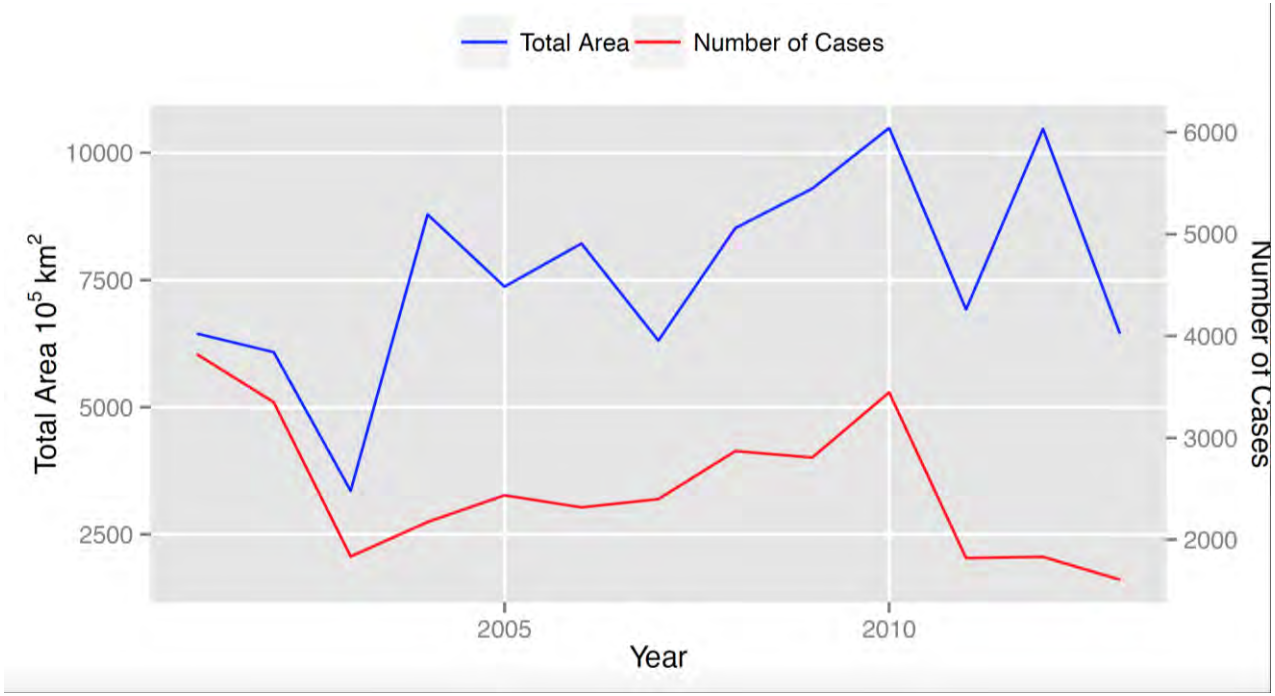
Malaria and Deforestation



- Deforestation associated with increased rates of malaria and increased vector biting in South America, Africa, and Asia
- Higher mosquito count of a species known to carry malarial parasite in secondary forests and oil palm plantations than in primary forest in Sabah

Malaria and Deforestation: Preliminary Sabah Data*

In Keningau, Kota Belud, and Tenom districts a positive relationship between deforestation and malaria (i.e. more kilometers of forest cleared was associated with more cases of malaria)



Kilometers of Forest Cleared in Sabah and Number of Cases of Malaria by year, 2000-2013 [Note: does not indicate correlation]

*Results from preliminary analyses only, EHA currently working to include additional variables and determine the relationship in Sabah

Nipah Virus and Agricultural Expansion

- Potentially fatal disease which can cause respiratory illness and encephalitis in humans
- Bats are reservoir for Nipah virus, and are under pressure from environmental change

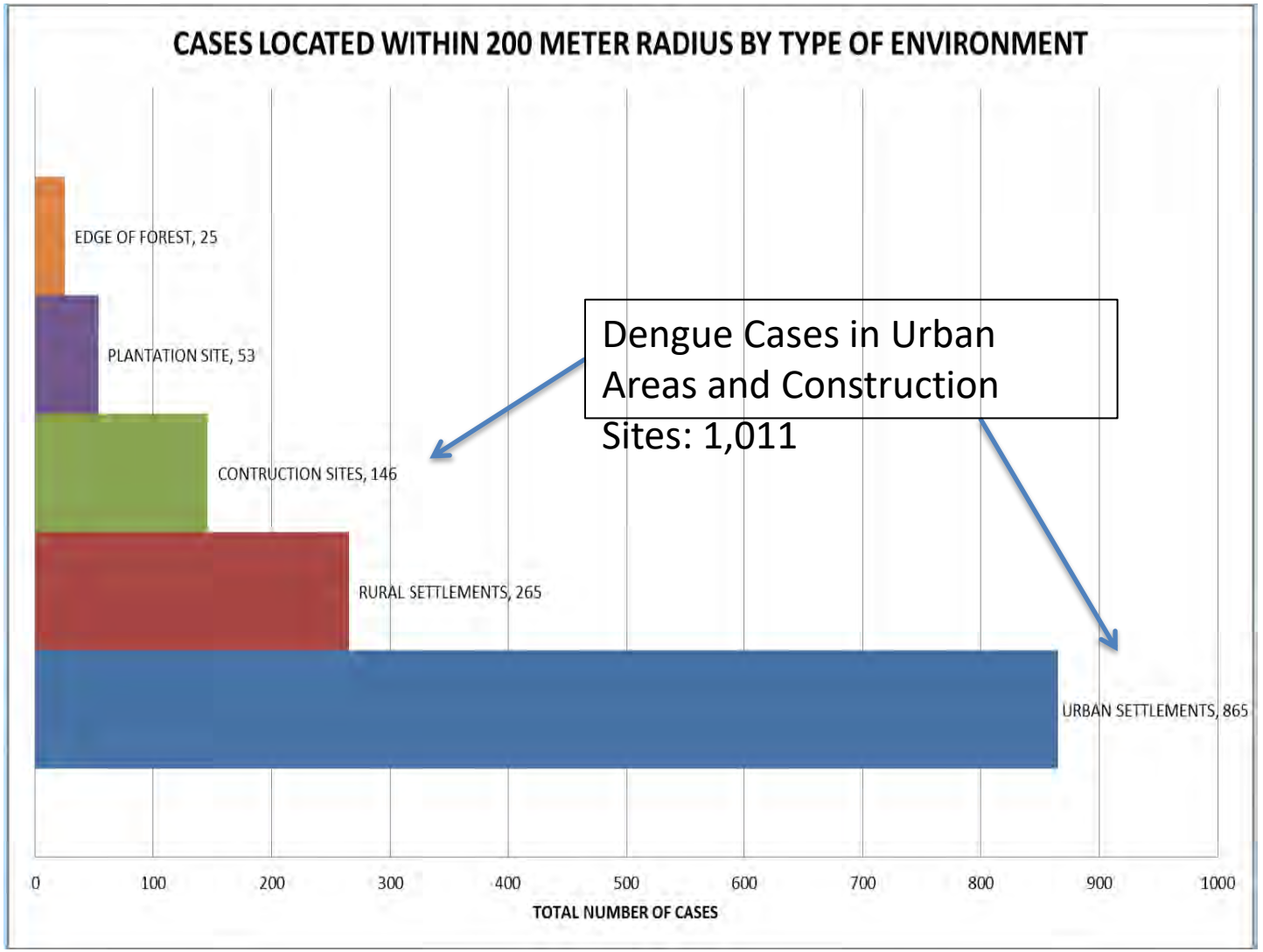
Nipah virus and Agriculture

Dengue Fever and Land-Use Change

- Association between land-use change and vector borne diseases
- In 2014, **1,452** cases of dengue in Sabah
- Commonly found in urban areas and at construction sites
- Construction sites identified as a common breeding spot for mosquitos in Sabah*

*Preliminary data

Dengue Fever and Land-Use Change



Source: Department of State Health Sabah

How might land-use change impact health?

- What are some additional ways that land-use change might impact health?
  - What types of land-use change?
  - What types of health outcomes?
- Potential health impacts of land use change may not affect all people equally
- Can you think of differences in how land-use change might impact various people or populations?
  - Who might be impacted differently?
  - What consequences does this have for the potential health impacts?

Activity: Gender, Land-use, and Health

- In your community, do men and women use land differently? How?
- In your community, does health behavior differ between men and women? How?
- How might these differences impact health and land-use change?
  - Think in terms of people impacted, recognizing the problem, mitigation strategies

Activity: Role Play

- In previous months, there are massive deforestation occurred around the forest in your village. Since two months ago, you have observed that there are 15 has villagers in your village were sick and it may due to the diseases link to land use change. The situation is critical and the Ketua Kampung and the JKK has set up a working committee to deal with the issue.

Strategies for Mitigating Health Impacts of Land-Use Change

How can we prevent or reduce the health impacts of land-use change? Who is responsible for implementing these plans?

Discussion: Strategies for Mitigating Health Impacts of Land-Use Change

- What do you think could be done to reduce the negative impacts of land use change on health?
  - Are there things you have seen work in the past?
  - New things that could be done?
- Who is responsible for reducing these impacts?
  - What role can community play? Government? Industry?
- What are the potential economic impacts of land use change and these strategies?
  - Consider both positive and negative impacts.
  - What is the cost of disease in a community? Who pays for these costs?

Land-use, Health, and Development

- Infectious Disease Emergence and Economics of Altered Landscapes Project (IDEEAL)
- Examining the health and economic impacts of land-use change
  - Example: Land conversion for agriculture
    - Benefits: Profit, creates jobs, GDP growth, community development
    - Consequences: Lost habitat for wildlife, erosion, land degradation, *increase in infectious diseases*
- Using model, can project best places to develop

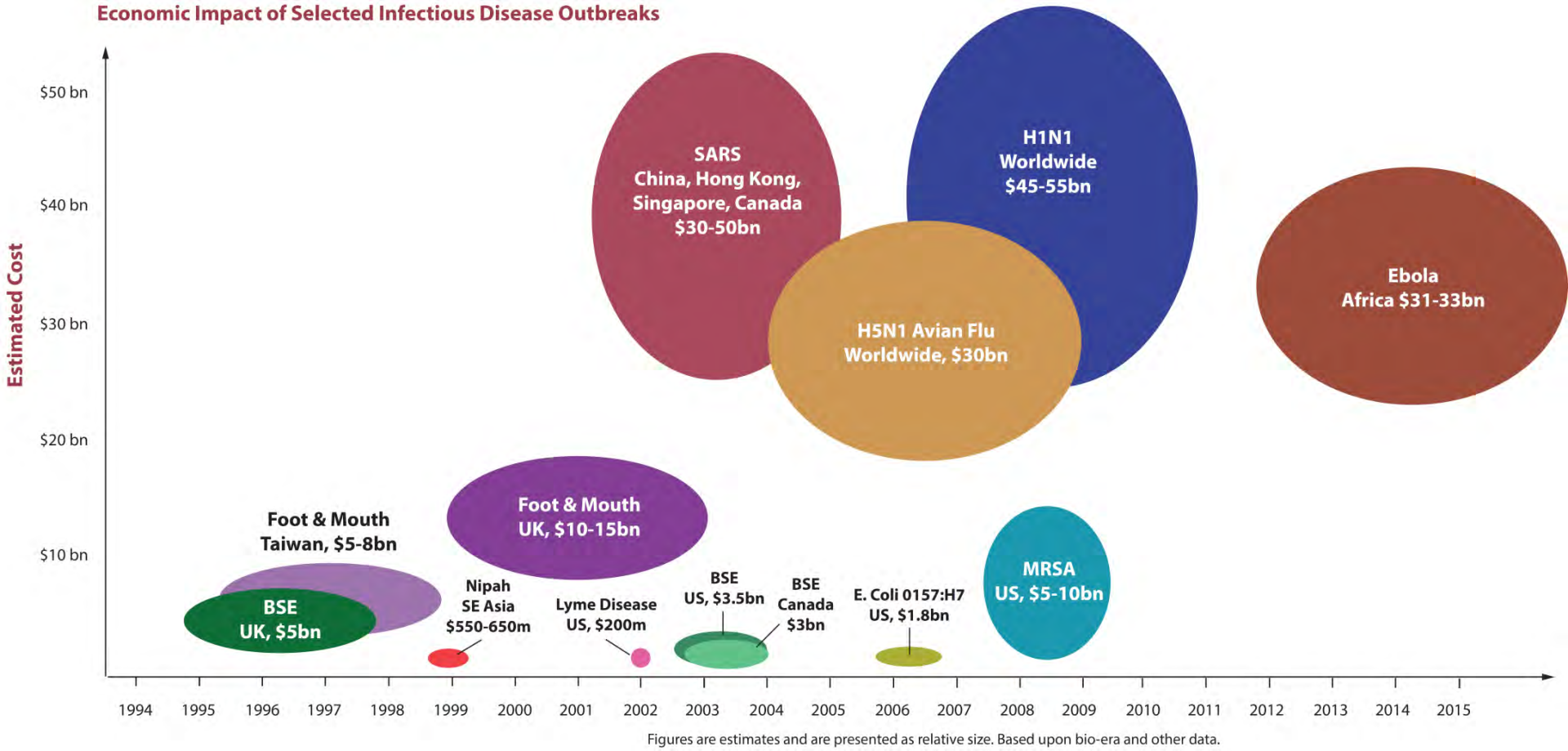
Recap: Health Impacts of Land-Use Change

- Changes in how land is used affects biodiversity & the health of the environment, which impacts human health.
- Lands are valued differently by people and these difference influence decisions about land-use change planning for land-use change
- Negative health impacts of land use change should be considered in making land use decisions.
- Strategies to reduce these negative impacts can be implemented to preserve human health.

Economic Costs of Land-use and Health Links

Quantifying the burden of disease related to land-use change

Economic cost of disease outbreaks



Economic Costs of Disease in Malaysia

National Costs for Selected Diseases

- **582 million USD** spent Nipah outbreak control 1989/99 in Malaysia (source: DVS).
- **40 million USD** spent by Malaysian government combating malaria in 2013, (source: WHO).

Economic Costs of Disease in Malaysia

Price Per Case, Tawau Hospital

- **4,360 MYR per case:** Diseases like **malaria, leptospirosis, dengue** (infectious and parasitic diseases without complications)
- **11,088 MYR per case:** Diseases including **rabies** and **viral encephalitis** (bacterial nervous system infections without complications)

(Source: Tawau Hospital Case mix data, 2013)

Economic Costs of Land-use and Health Links

What is the cost of disease? Who pays these costs?